Length of the School Day and its Influence on New Jersey High School Proficiency Assessment Scores

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ABSTRACT

This paper presents results from an examination of the relationships between high school (HS) school day length and 2011 New Jersey High School Proficiency Assessment (HSPA) Math and Language Arts Literacy test results. Variables found to have an influence on standardized test scores in the extant literature were evaluated and reported. Hierarchical regression models were used to determine the strength of the predictive influence of these variables, specifically school day length, on both HS Math and Language Arts Literacy student performance. Results indicated that school day length does not have a significant influence on HS LAL achievement but that it accounted for 1.8% of the variance in HS Math achievement scores. Implications for practicing administrators are discussed.

Social forces today are more apparent than they were in the 1930s. Globalization, technological advances, communication patterns, energy consumption, and the competition for jobs and resources mandate changes in schools. The demand for educational results and choice has spurred controversial issues such as school vouchers and charter schools. Federal, state, and local governments have become deeply entrenched in managing education and legislating reform in structure and accountability. Nevertheless, standards-based reform does not appear to be concerned with student needs or social theory.

Gaining momentum in legislative circles is the idea that a longer school day and/or year will produce increased student achievement as measured by state mandated standardized tests.

Since the initial mention of school time and the learning model proposed by Carroll (1963), school reforms have become cloaked in the belief that more time equals more achievement. In recent times policymakers, pundits, and education bureaucrats claim that more time in school translates into increased test scores that somehow affects the ability of the U.S. workforce to better compete globally.

Problem, Purpose, and Research Questions

Our purpose for this study was to explain how much influence, if any, school day length (as reported in minutes) had on student aggregate performance in New Jersey comprehensive high schools, on the HSPA 2011 Mathematics and Language Arts exam.

This study was guided by the overarching research question: What is the influence of length of school day on the Grade 11, 2011 New Jersey state-mandated High School Proficiency Assessment (HSPA) scores when controlling for student, school, and staff variables?

Conceptual Framework

America has been dazzled by Frederick Taylor's scientific management framework and has tried to employ these constructs to education; the production-function theory—the more one puts in, the more one gets out. The theoretical framework for this research study was aligned with input-output models.

Zhang & Chen (2008) stated, "Education is different from other kinds of products: its output is not a change in the 'physical properties' of students. Educational output includes the increase in knowledge, qualification, attitudes, perceptions, emotions, and skills that students receive from this kind of production process"…"and it is, however difficult to quantify the increase" (pp. 206-207). "…Educational outputs are influenced by a political process that can respond to local differences in demand for public education in both budgetary (input) and output

dimensions" (Klein, 2007, p. 2). Furthermore, "…student demographic characteristics and family background better explain their performance on standardized tests than do measures of the resources devoted to their education" (Klein, 2007, p.3).

Literature in a Snapshot

The objective of this literature review was to identify empirical studies that captured a statistical significance, if any, related to student, school, and teacher variables on student achievement in Grade 11 as measured by the NJ HSPA tests in Language Arts and Mathematics.

High-Stakes High School Exit Exams

Graduation requirements based on high-stakes, high school exit tests became a universal policy tool in some states including New Jersey in the post No Child Left Behind (NCLB) era; therefore, as researchers we sought to define the relationship of variables impacting test scores to encourage educational policy reforms based on science and not politics.

According to Ou (2009), many marginalized groups do not graduate because "high school exit exams are more prevalent in states with higher percentages of economically disadvantaged and minority students" (p. 171). McIntosh (2012) emphasized that "nearly 7 out of 10 students, and an even larger share of students of color, attend school in states with exit exams. Sixty-nine percent of the nation's students are enrolled in states with exit exams, including 71% of African American students, 85% of Hispanic students, 71% of low-income students, and 83% of English language learners (ELLs)" (p. 2). Socioeconomic status and minority marginalized groups are variables proven to significantly influence student achievement. Therefore, it is perplexing that these disenfranchised groups are the very ones being tested and held accountable for a high school diploma; this screams of inequity and discriminatory practice.

McIntosh (2012) contended that although results from empirical research says the opposite, "Proponents of exit exams, who often include state governors, chief state school officers, and state boards of education, maintain that requiring students to pass an exam will raise academic achievement and ensure that students graduate from high school with the knowledge and skills needed for college or careers" (p. 36). In fact, "the evidence indicates that low-achieving students—those often targeted by these policies—do not experience gains under the more rigorous exams" (McIntosh, pp. 487-488).

Tienken (2011) found a flaw in the construct validity of high school exit (high-stakes) exams, nationally, which he refers to as a "conditional standard error of measure" (CSEM), (p.301). That translates into the fact that a margin of error on all these tests may result in ±10 points from a student's individual true scale score. Therefore, many students may in fact pass the high-stakes test but be categorized as failing and consequently be prevented from graduating from high school. Furthermore, Tienken (2011) suggested that a policy adjustment should be made to ameliorate the impact of CSEM on any single test score that determines the fate of students and families.

Student School Attendance

Student school attendance has been linked to achievement. Gottfried (2010) evaluated the relationship between student attendance and achievement in Philadelphia elementary and middle schools. "Positive and statistically significant relationships between student attendance and academic achievement as expressed in GPA for both elementary and middle school students" was found (Gottfried, 2010, p. 434). "The effect sizes, as defined by the standardized regression coefficient, ranged from 0.24 to 0.34, thereby indicating that the attendance-achievement relationship is fairly consistent for the full sample and across elementary and middle school

sample" (Gottfried, 2010, p. 446). Math achievement was especially sensitive to school absenteeism as well as standardized test scores, graduation and dropout rates (Balfanz & Byrnes, 2012, p. 3). Several researchers reported that students with healthier attendance histories had stronger test performance (Balfanz & Byrnes, 2006; Lamdin, 1996; Nichols, 2003). Roby (2003) concluded that based on the analysis of educational outcomes in Ohio for 3,171 schools (711 schools for 9th grade and 691 schools at 12th grade), a statistically significant relationship existed between attendance and achievement in 4th, 6th, 9th, and 12th grades.

Socioeconomic Status

Abrams & Kong (2012), Graziano (2012), and Tienken (2012) supported and conveyed the fact that SES is directly related to student achievement. Researchers studying student mobility also established that SES has a greater influence on Math than on LAL performance (Ashby, 2010; Xu, Hannaway, & D'Souza. 2009). Tienken (2012) advised that disadvantaged students have never been reported as scoring higher than their middle class or more advantaged peers on any state test at any grade level. The achievement differences between economically disadvantaged and economically advantaged students ranged from 12 to 36 percentile points on state-mandated high school tests of language arts and mathematics (Tienken, 2012).

What makes a difference in student achievement: "Family background characteristics and other out-of-school factors clearly have a profound influence on students' academic achievement" (Abrams & Kong, 2012; Coleman, 1988; Sirin, 2005; West, 2012, p. 38) In fact, Coleman et al. (1966) first espoused that minority children (with weak family educational backgrounds) are likely to have increases in achievement when they are schooled with students with strong family educational backgrounds (p. 22).

Abrams and Kong (2012) ascertained that "research demonstrates that socioeconomic status (SES) is the strongest predictor of academic achievement" (Abrams & Kong, 2012, p. 1,

18). Abrams and Kong (2012) are supported in this finding by other researchers: Armor, 1995; Bradley, 2002; Caldas, 1993; Coleman et al., 1966; Duncan, 1994, 1995; Fetler, 1989; Gamoran and Long. 2006; Goldhaber, 2002; Hattie, 2009; Jencks et al, 1972; Lacour, 2011; Levanthal, 2000; Sirin, 2005; and White, 1982.

> …a school's average student characteristics, such as poverty and attitudes toward school, often had a greater impact on student achievement than teacher and schools and that the average teacher characteristics at a school had a small impact on a school's mean achievement (Graziano, 2012, p. 54; Michel, 2004, p. 29; Pereira, 2011, p. 53).

Quantitative Methodology

The sample for the study was selected purposefully to represent only New Jersey's public, comprehensive, and academic secondary schools that reported all required information related to school, staff, and student variables to the New Jersey Department of Education (NJDOE). From the more than 400 public secondary schools in New Jersey, 326 were included in the sample. Vocational schools, special services school districts/special education schools, and charter schools were excluded from the study to ensure all results obtained from the analysis were attributed to a typical district New Jersey public high school. The unit of analysis for this study was at the school level.

This explanatory, non-experimental study used correlation research and hierarchical multiple regression analysis (at a single point in time) to measure the relationship between two variables: length of school day and Grade 11 NJ 2011 HSPA scores. The analysis provided quantitative descriptive research on the relationship of length of school day in New Jersey secondary schools Grade 11 students in "A-J" districts and scores on the NJ Grade 11, 2011

HSPA (Note: “A” schools represent the lowest socio economic communities while “J” schools represent the wealthiest economic communities).

HSPA is used to determine student achievement in reading, writing, and mathematics as specified in the New Jersey Core Curriculum Content Standards for Grade 11. The NJ HSPA scores are scaled to fit into the 100-300 range of possible points available, where >200 is Passing/Proficient.

A “simultaneous” data entry method (using the SPSS comprehensive statistical analysis and data management software product) created statistical models used to create a series of hierarchical regression models (Witte & Witte, 2010). When the predictor variables (i.e., staff, school, and student) were entered into SPSS using the hierarchical regression method the models provided data on the specific contribution of each variable on HSPA LAL and Math student performance. In this study the untransformed dependent variable 2011 HSPA Passing score is identified as TP+AP (total proficient and advanced proficient) with MA Transformed labeled TPReflect and LA Transformed referenced as TPLA_Reflext. The independent variables include staff, student, and school: a) Staff – Faculty attendance rate (FAttend), faculty mobility rate (FMobility), and Percentage of staff with master’s degrees or higher (MA+); b) Student - Student attendance Rate (G11Attend), student mobility rate (STMOB), percentage of students eligible for free or reduced lunch (SES), percentage of students with disabilities (DIS), and percentage of students with limited English (LEP); c) School – Length of the school day (SCHDAYL) and school size (enG9to12).

A major difference in this study, from other studies about school day length, is that the variables of school day length and SES strata were analyzed separately (as well as analyzed with

and without the covariate of attendance). To apply findings at the school or district level, passing percentage changes were calculated between short, medium and long day lengths.

Results and Discussion

Results from this study suggested that school day length is a statistically significant but weak predictor of HSPA Math performance and not a statistically significant predictor of LAL performance.

Table 1 displays the major findings from the hierarchical multiple regression analysis that used log 10 transformed (TPReflect/Reflext) and untransformed data from the performance data obtained from the total proficient (TP) and advanced proficient (AP) scores on 2011 NJ HSPA Language Arts (LA) and Math (MA).

The final hierarchical regression models (when using the transformed dependent variable) for both MA and LA had significant predictive capabilities on the HSPA passing rates. The fact that the adjusted R^2 of 64.0% for LA was about five percentage points higher than the MA adjusted R^2 of 58.7% showed that the LA regression model had slightly higher predictive power than the MA model.

Both MA and LA socioeconomic status (SES) had the greatest influence on HSPA passing percentages; the extant literature supports this outcome. This was demonstrated by the fact that SES had the largest R^2 value contribution—43.1% for MA and 48.1% for LA—in each subject's final regression model. Unfortunately, SES is a variable that schools have little power to change and hence the predictive powers of other more mutable variables need to be examined.

The other significant variables for MA included G11attend (student attendance), SCHDAYL, and MA+, while for LA the significant variables were G11attend, SCHDAYL, DIS, MA+, and enrG9to12 (student enrollment). The variables that school administrators have some

ability to change include G11attend, SCHDAYL, MA+, and enrG9to12. While some school districts might be able to reduce the number of special education (DIS) students housed in regular high schools, this cannot always occur because of public policy, budgetary, legal, and other constraints.

When analyzing the results, one must remember that a transformed dependent variable—which involved both a reversal of the scores and a non-linear (i.e., log10) transformation of the scores—was used in all regression analyses. The problem with using a transformed variable was the difficulty in determining the actual percentage point effect on the HSPA passing rates for each of the predictor variables.

Table 1

Summary of Major Findings from Hierarchical Regressions

HSPA Subject & Dependent Variable	Variables & Significance	Sig. Variables & Standardized Beta's* (β)	Adjusted R^2 (% of Variance Explained by the Model)	SCHDAYL *p*-value
MA TP+AP	SES (.000) G11attend (.000) SCHDAYL (.000)	SES (-.55) G11attend (.41) SCHDAYL(.14)	69.3% * (Model 3)	Statistically significant (.000)
MA TPReflect*	SES (.000) G11attend (.000) SCHDAYL (.000) MA+ (.003) DIS (.255)	SES (.50) G11attend (-.30) SCHDAYL (-.23) MA+ (-.12) DIS (.04)	58.7% (Model 5)	Statistically significant (.000)
LA TP+AP	G11attend (.000) SES (.000) DIS (.040) FMOBILITY (.026) FATTEND (.057)	G11attend (.58) SES (-.38) DIS (-.07) FMOBILTY (.07) FATTEND (-.07)	68.5% (Model 5)	Not statistically significant (.151)
LA TPLA_Reflext*	SES (.000) G11attend (.000) SCHDAYL (.000) DIS (.000) MA+ (.010) enrG9to12 (.037)	SES (.46) G11attend (-.33) SCHDAYL (-.18) DIS (.15) MA+ (-.10) enrG9to12 (-.08)	64.0% (Model 6)	Statistically significant (.000)

*Note: Regressions with transformed dependent variables have a standardized β (Beta) whose signs are opposite. A negative β (Beta) value means that the associated predictor variable has a positive relationship with the HSPA passing percentage similarly a negative β (Beta) value means that the predictor variable has a positive relationship with the HSPA passing percentage.

The fact that the adjusted R^2 value for the final hierarchical MA model with the untransformed dependent variable is about 11 percentage points higher than that for the final hierarchical MA model with the transformed dependent variable (69.3% vs. 58.7%) suggests that the regression model using the untransformed dependent variable is superior to (in the sense that it has more predictive power) than the regression model using the transformed variable.

Table 2 emphasizes that for the poor schools, lengthening the school day from a short to a median day virtually had no impact on HSPA MA passing rates. Interestingly, increasing the

school day from a median length to a long length day resulted in a rise of about 6 percentage points in the passing rate on HSPA MA for poor schools. Subsequent analysis on the median and wealthy SES schools showed little variation in the HSPA LA passing percentages when the length of the school day was increased. For the poorer schools the HSPA LA passing rate declined from a short to a median length day but improved about 3.5 points when the school day was increased from a median to a long day.

Table 2

Influence of the Length of the School Day by SES Category

SES Category	MA SCHDAYL Short to Med Range =347-397 Median=390	MA SCHDAYL Med to Long Range=398-415 Median= 406	MA SCHDAYL Short to Long Range= 416-515 Median=435	LA SCHDAYL Short to Med Range =347-397 Median=390	LA SCHDAYL Med to Long Range=398-415 Median= 406	LA SCHDAYL Short to Long Range= 416-515 Median=435
Poor (Mean SES =59.9%)	0.14	5.75	5.89	-2.48	3.35	0.87
Med (Mean SES =19%)	0.84	0.30	0.14	-0.43	-0.60	-1.02
Rich (Mean SES =19%)	1.98	0.59	2.56	0.22	-0.70	-0.49

The estimated marginal means illustration in figures 1 and 2 highlighted each SCHDAYL/SES bin combination mean passing percentage, after controlling for differences in student attendance rates among the schools included in the study. Even when controlling for differences in student attendance rates, the length of the school day had little influence on HSPA MA passing percentages for the both rich schools and median SES schools. Increasing the school day for the poorest schools from a median to a long day did increase the MA passing percentage by about 6 points. However, for LA a decline in scores for the poorest schools is illustrated when a short day is replaced by a median length day and the scores only increase slightly if a longer day is implemented. Both the median and wealthier schools LA scores decline when the school day is lengthened.

Figure 1: MA Estimated Marginal Means Untransformed Dependent Variable (TP+AP) with Binned SCHLDAYL and SES with Covariate G11 attend

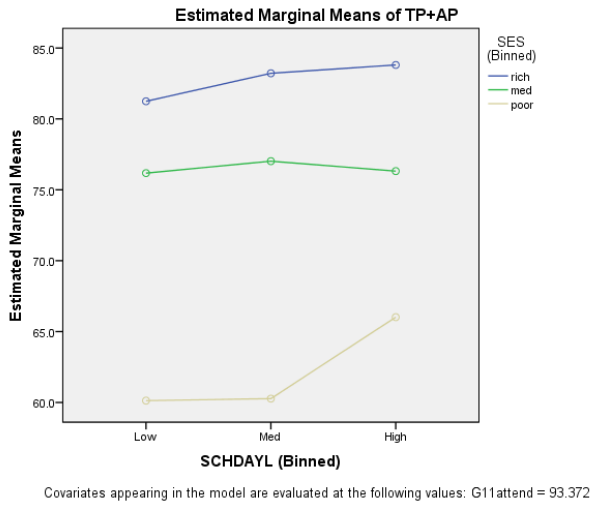
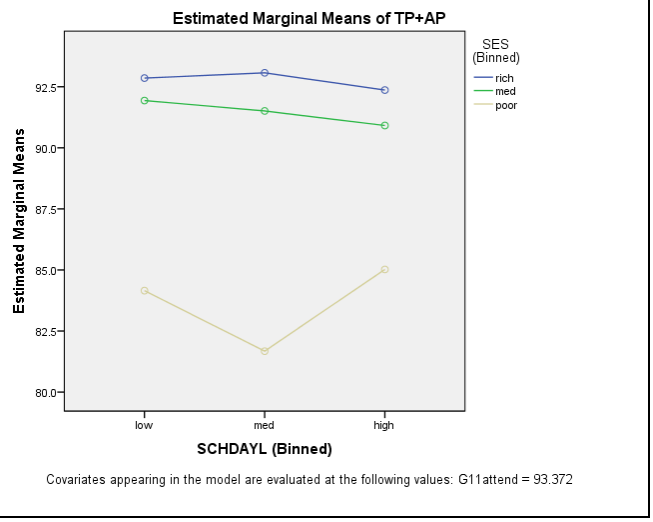


Figure 2: LA Estimated Marginal Means Untransformed Dependent Variable (TP+AP) with Binned SCHDAYL and SES with Covariate G11attend



Implications for Practice

School principals need to be proactive in their quest to build relationships and to educate families about the importance of student school attendance. Parents participating in parent

conferences, PTA meetings and family nights, especially in poorer districts, can increase student achievement at the high school level. “Research shows that families are more likely to be involved when staff reach out to them and also when they feel that their involvement is appropriate and will be effective” (Hoover-Dempsey & Sandler, 1997; Moll, Amanti, Neff, & Gonzalez, 1992, as cited by Kakli et al. p. 11).

For learning to occur, especially for students in low-income designated strata, students need to attend school and be in class learning (Gottfried, 2010). The analyses in this study showed a significant and positive relationship between student attendance and academic achievement. Therefore, more focus on attendance policies that have the potential to positively influence HSPA passing percentage rates should gain administrative focus, including increasing parent awareness about the importance of students being in the classroom. Children have to attend school in order to learn; chronic absenteeism for any child for any reason is detrimental to their ongoing development but even more profound for younger children of poverty. The subject of math is particularly sensitive to student attendance and researchers reported that students with better attendance records, especially those of poverty, have stronger test performance (Balfanz & Byrnes, 2006, 2012; Lamdin, 1996; Nichols, 2003).

When a student misses class time, for schedule changes or for any other reason, the missed time negatively affects academic achievement. Research consistently showed that more instructional time led to higher achievement (Dreeben & Gamoran, 1986, cited by Kubitschek, Hallinan, Arnett, Galipeau, 2005; Karweit & Slavin, 1981; Wiley, 1976). Principals can increase accountability for non-instructional time at the local level.

Because of the significant expense in lengthening the school day for all schools, policies and practices should be more focused on creating strategies that improve student attendance

rates. Missed class time within the high school day is not tracked. Students are known to miss class time for assemblies, field trips, testing, college interviews, public service activities, sports events, rehearsals or actual musical/theatrical programs, guidance counselor or discipline meetings, missed time due to schedule changes, in-school and out-of-school suspensions as well as a host of other events. This missed class time (non-instructional time) needs to be controlled and tracked by administration so that student learning is not negatively impacted (Aaronson et al., 1998).

Recommendations for Future Research

This research adds to the extant literature on the influence of the length of the school day and student achievement on the NJ HSPA. Obviously a single study cannot relate all the elucidations that influence student achievement on a state's exit exam. However, the variables examined in this study were taken from the NJ School Report Card data to provide direction for further research and enable local district level use. The results of this study were supported in the extant literature by the factors identified as influencing student achievement. Nevertheless, this study focused solely on public high schools in one state. The following topics may add value to the extant literature on the influence of the length of the school day and student high school exit exam achievement:

1. Devise a high school study to examine the actual minutes used for non-instructional purposes.
2. Conduct a study on early academic interventions for freshman and sophomore high school students who score low on state standardized tests in math and language arts.
3. Conduct a study to compare the curriculum and academic interventions among schools with the highest and lowest school day lengths.

4. Conduct a study on high schools with the highest and lowest poverty rates to compare the curriculum and academic interventions provided for low scoring standardized testers.
5. Design a study that examines the influence of parent involvement at the high school level on the passing rates of the HSPA.

We cannot let politicians or federal and local governments implement and influence educational policies that will not lead to increased student growth and academic achievement. Educators must speak out publicly and do the right thing locally to improve the education of each child.

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Appendices

Table 3

MA Model Summary[f] Hierarchical Regression with Transformed Dependent Variable (TPReflect)

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.657[a]	.431	.429	.22765	.431	245.428	1	324	.000	
2	.724[b]	.524	.521	.20858	.093	62.934	1	323	.000	
3	.762[c]	.581	.577	.19603	.057	43.696	1	322	.000	
4	.769[d]	.591	.586	.19383	.011	8.338	1	321	.004	
5	.770[e]	.593	.587	.19374	.002	1.299	1	320	.255	1.730

a. Predictors: (Constant), SES
b. Predictors: (Constant), SES, G11attend
c. Predictors: (Constant), SES, G11attend, SCHDAYL
d. Predictors: (Constant), SES, G11attend, SCHDAYL, MA+
e. Predictors: (Constant), SES, G11attend, SCHDAYL, MA+, DIS
f. Dependent Variable: TPREFLECT

Table 4

LA Model Summary [g] Transformed Dependent Variable (TPLA_Reflext)

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.694[a]	.481	.479	.25277	.481	300.266	1	324	.000	
2	.769[b]	.592	.589	.22456	.111	87.495	1	323	.000	
3	.791[c]	.625	.622	.21548	.034	28.811	1	322	.000	
4	.797[d]	.635	.630	.21299	.010	8.557	1	321	.004	
5	.801[e]	.642	.636	.21121	.007	6.431	1	320	.012	
6	.804[f]	.647	.640	.21011	.005	4.385	1	319	.037	1.986

a. Predictors: (Constant), SES
b. Predictors: (Constant), SES, G11attend
c. Predictors: (Constant), SES, G11attend, SCHDAYL
d. Predictors: (Constant), SES, G11attend, SCHDAYL, DIS
e. Predictors: (Constant), SES, G11attend, SCHDAYL, DIS, MA+
f. Predictors: (Constant), SES, G11attend, SCHDAYL, DIS, MA+, enrG9to12
g. Dependent Variable: TPLA_Reflext